

(5) The revised and enlarged edition of Stewart's "Light" contains a very full treatment of the elements of geometrical optics. The inclusion of a large number of simple practical experiments enhances the value of the volume considerably. Dispersion and spectrum analysis receive a fuller treatment than in the previous edition. The book will prove distinctly useful.

(6) An introductory text-book of theoretical physics, the subject-matter having been selected with reference primarily to its value as part of a general education. Problems are interspersed at frequent intervals, and some of these are well designed to make a student think. A great deal of care has been exercised in the compilation of this book.

(7) This text-book of physics, which includes mechanics, heat, light and sound, electricity and magnetism, has been written for pupils in the American high schools. The statements are concise, and the diagrams clear. It is thoroughly up to date, and will prove a very suitable introductory course, especially if, as the author intends, laboratory work is carried out at the same time.

(8) The author in his preface intends this book for that class of technical students who are ignorant of the rudiments of algebra, geometry, trigonometry, and mechanics. The book includes three introductory exercises, six exercises on magnetism, and twenty-six on current electricity and its applications. There is very little in the method of treatment to distinguish it from other elementary text-books of practical electricity and magnetism. It is doubtful whether a student will draw a correct idea as to what determines a spark in air from the statement on p. 30:—

"Join 1 ft. of copper wire to one terminal (of a Leclanche cell) and brush the other terminal with the free end of the wire. No spark is seen because the E.M.F. of the cell is only about 1.3 volts and the resistance is high, so the maximum current is very small."

And on p. 32 (repetition with storage cell):—

"The E.M.F. is about 2 volts, and the resistance is very small, so the maximum current is large. Sparking is abundantly shown."

No thoughtful teacher would instruct a student to count the number of vibrations a magnet makes in a given time, as in the experiment described on p. 13. Elementary electrostatic experiments are omitted, as these are thought to be relatively unimportant and difficult. There is little to recommend this book when compared with some excellent introductions which have appeared in recent years.

#### OUR BOOK SHELF.

*Animal Artizans and other Studies of Birds and Beasts.* By C. J. Cornish. Pp. xxxiv+274; illustrated. (London: Longmans, Green and Co., 1907.) Price 6s. 6d. net.

THE late Mr. Cornish was a constant contributor of articles bearing upon natural history matters to the columns of the *Spectator* and *Country Life*, and the present volume, which is edited by his widow, consists mainly of a reprint of articles from those

journals, with such modifications as the course of time has rendered necessary or advisable. In some cases the articles had been revised with a view to publication in book form by Mr. Cornish himself, but where this had not been done in the author's lifetime the task devolved upon the editor.

The volume opens with a brief account of the life of Mr. Cornish, which will no doubt be welcome to the numerous readers who find entertainment or instruction in his works. Following this are several articles, upon which the title of the volume is evidently based, some of these dealing with the works of such birds as the South American oven-bird and our own woodpeckers, while "road-making animals" and "landscape-gardeners" form the subjects of others. Several of these articles display a lamentable want of knowledge of scientific zoology on the part of the author. We are told, for instance, on p. 34, that "the musk-ox, the *ovibos*, is as much akin to the sheep as to *bovidae*, and in habits more like what we imagine the undescended great wild original of our sheep was than are the wild sheep of to-day." In regard to the first half of the sentence, it is now accepted that the musk-ox is not a near relative of either sheep or oxen, while the whole group is included in the *Bovidae*. As to the meaning of the second half of the sentence, we are altogether in the dark. Again, on p. 48 we notice the astounding information that the pampas stag is the only large ruminant on the plains of South America, which, by the way, are stated to be formed of clay. Other similar cases might be cited, but in the case of a posthumous work criticism must not be too trenchant; and, after all, the volume is perhaps sufficiently accurate to suit the requirements of the readers to whom it is likely to appeal.

*Rubber in the East.* Being the Official Account of the Ceylon Rubber Exhibition held in the Royal Botanic Gardens, Peradeniya, in September, 1906. Edited by Dr. J. C. Willis, M. Kelway Bamber, and E. B. Denham. Pp. 269; illustrated. (Colombo: H. C. Cottle, Government Printer.)

THIS interesting and up-to-date work is the official account of the Ceylon Rubber Exhibition held in the Royal Botanic Gardens, Peradeniya, in September, 1906 (see *NATURE*, December 27, 1906, p. 209). The duration of the exhibition allowed of its being a Rubber Congress, lectures being given upon the various branches of the subject from cultivation to vulcanisation. These lectures, discussions, judges' reports, &c., have been brought together in the present volume and arranged in a logical order with the hope of making this account a standard treatise upon the rubber industry as it at present exists.

The chapters dealing with the cultivation of rubber in Ceylon and other countries, treatment of diseases, tapping knives, machinery for the treatment of latex, and the shipment and marketing of rubber, should prove valuable aids to the practical rubber grower.

Some idea of the rapid growth of the industry is gathered when we see that five years ago there were only 2500 acres under rubber in Ceylon, and to-day 104,000 acres, the *Hevea brasiliensis* being the species most extensively planted. This tree produces the well-known Para rubber, which, prepared in the ordinary way, possesses 90 to 95 per cent. of caoutchouc. The *Hevea* appears to stand tapping operations even when of a very drastic nature.

High tapping has been tried on some plantations up to 30ft. and 50ft., and this system gives in some cases 12lb. to 14lb. of rubber per tree; but there is

a curious phenomenon in connection with this high tapping, viz., the frequent difficulty of coagulating the latex.

One lecturer, Mr. J. B. Carruthers, deals with the possibility of rubber for pavements for roadways, and mentions the rubber pavement under the archway leading to Euston Station, which was laid down in 1881. In 1902 the pavement was found to have worn down to  $\frac{1}{8}$  of an inch in the thinnest places. This rubber pavement cost less than three times as much as wood or asphalt, but the life of wood or asphalt was four years, and the life of a rubber pavement twenty years. The book is well illustrated throughout, and there are some interesting maps of Ceylon, Perak, &c., showing lands under rubber or alienated for rubber.

L. C. B.

*Some Modern Conditions and Recent Developments in Iron and Steel Production in America.* By Frank Popplewell. Pp. x+119. (Manchester: University Press, 1906.)

THIS report contains an account of a visit to the iron and steel-producing centres in the United States from September, 1903, until April, 1904, made by the author as Gartside scholar of the University of Manchester. It comprises an introductory sketch of the metallurgy of iron and steel, some general considerations on the extent of the American industry, and descriptions of the raw materials used, of the production of pig iron, and of the manufacture of steel and of rolled steel products, and, lastly, some notes on American labour and education.

The author employed his time well, and has given a clear idea of modern conditions. The important subjects of the Steel Trust, organised labour, and railway transport are not touched upon, and the report suffers from the disadvantage that progress is so rapid in America that in the interval that has elapsed between the visit and the publication of the report many important changes have been effected which have rendered some of the information collected antiquated, and much of the interest has been impaired by the publication of reports by later visitors, notably in the German work by Dr. H. Levy, and in papers written by members of the Iron and Steel Institute who took part in the New York meeting of that society. Thus there is no mention of the most interesting novelty in blast-furnace practice, namely, Mr. Gayley's desiccation of the blast by a preliminary chilling of the air before its admission to the cylinder of the blowing engine, nor does the index refer to the Talbot continuous steel-making process which, first used at Pencoyd, has proved surprisingly economical in this country. Mr. Popplewell gives, however, a clear exposition of the results of specialisation in production, of the development of ore-handling machinery, and of the general use of the charging machine, features that characterise American practice. He shows, too, that the colossal blast furnace with huge yield due to high-blast pressure, regardless of consumption of steam and boiler coal, is giving place to a blast furnace of more modest dimensions, with a maximum height of 80 feet or 85 feet, for the treatment of fine ores.

The impression derived from reading Mr. Popplewell's report is that many of the most striking developments, admirable as they are, were designed to meet special wants, and are not necessarily applicable in Great Britain. Thus, to give one example, the enormous stock piles called for by the intermittent navigation of Lake Superior are not required in districts where supplies arrive continuously throughout the year.

## LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

### The Positive Charge Carried by the $\alpha$ Particle.

IN a letter in NATURE (August 2, 1906) I gave an account of some experiments which I considered proved that the  $\alpha$  particle as initially expelled is not charged, and I also gave an account of the same work in a paper read before the British Association at York last August. Although I have no reason to doubt the accuracy of the experiments published in my letter, I do not now consider them sufficiently conclusive, as some recently published researches on the  $\alpha$  particle have to be taken into account in their interpretation. I refer chiefly to a paper published by Rutherford shortly after my letter (*Phil. Mag.*, October, 1906, p. 348), in which the view is put forward that the  $\alpha$  particle carries two atomic charges.

Now the reasoning in my letter was based on the assumption, then held universally, that the charge on the  $\alpha$  particle was the indivisible single atomic charge, and it was not necessary at that time to contemplate the possibility of any intermediate condition existing between the  $\alpha$  particle charged and uncharged. But it is clear that if, as Rutherford considers probable, the  $\alpha$  particle carries a multiple charge, the results I published in my letter do not by themselves suffice to prove that the  $\alpha$  particle as initially expelled is uncharged, for it might possess a fraction of its final charge initially, obtaining the remainder and becoming correspondingly easier to deviate magnetically in its passage through matter. This is, of course, a contingency not contemplated in my original conclusion.

I had hoped long ere this to submit this point to an experimental test, which is simple enough to do by varying the strength of the field. But I very much regret I have no longer the essential facilities necessary to carry on the investigation, particularly the means of obtaining a steady supply of liquid-air, and there does not appear to be any immediate prospect of my being in a position to repeat the experiments. The question at issue is a somewhat fundamental one in the relations of electricity and matter, and, of course, cannot be finally settled by any one series of experiments, but only after long-continued and frequently verified observations. But I can neither continue the investigation nor even repeat the experiments I have already made, so nothing remains but to withdraw what I have already published.

FREDERICK SODDY.

The University, Glasgow, February 26.

### The Rusting of Iron.

IN NATURE of February 21 (p. 390) appears a letter from Prof. Wyndham R. Dunstan in which he represents me as having concluded "that carbonic acid is essential to the rusting of iron, and that rusting does not occur in its absence." As such a general statement, without reference to the context of the paper to which Prof. Dunstan refers, may prove misleading, I shall be obliged if you will allow me to point out that the main and incontrovertible conclusion drawn from experiments extending over a prolonged period is that iron does not undergo oxidation in presence of oxygen and water. If, however, a minute quantity of acid (either carbonic acid or any other acid capable of attacking iron) be present, the metal is first converted into ferrous salt, which subsequently oxidises to rust. Samples of iron which contain such impurities as sulphur, phosphorus, and carbides may give rise to free acids when in contact with water and oxygen, and under these conditions rusting may be expected to occur, even if carbonic acid be rigorously excluded.

Prof. Dunstan does not inform us if he adheres to his definitely expressed views "that iron, oxygen, and liquid water are alone necessary for the rusting of iron to take place," and that "hydrogen peroxide is a necessary intermediate product of the chemical change involved in rusting," but he confines himself to stating again that acid potassium chromate, a substance which destroys hydrogen